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Brigade Operations in

AirLand Battle-Future

Support Analysis for TRADOC Warfighter GOWS II

Directorate of Combat Developments

U.S. Army Armor School

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19. ABSTRACT (Continue on reverse if necessary and identify by block number)
Report evaluates alternative Brigade organizations' ability to execute ALB-F. In addition, contributions by Brigade Scouts, Division Cavalry, and the CSS requirements for ALB-F were evaluated. Finally, the ability of artillery and aviation to fix the enemy was evaluated.

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The purpose of this report is ;

1. **Purpose.** To evaluate the combat effectiveness of proposed AirLand Battle-Future (ALB-F) brigade organizations. ─➤ *fo 1473*

2. **Background.**

    a. To address the major changes in military threats around the world, TRADOC is conducting analyses to determine the best warfighting doctrine and the organizations and equipment to implement it. ALB-F focuses on non-linear battlefields that could occur in any part of the world. It emphasizes the use of agility to wage a battle of maneuver instead of attrition.

    b. As a part of that effort, the U.S. Army Armor School evaluated three brigade organizations' ability to move to an area of operations, destroy an attacking tank regiment, protect the force by use of scouts and cavalry, and perform recovery. Two additional issues were examined: the ability of aviation and artillery assets to fix and kill an attacking threat force.

    c. Detailed descriptions of the organizations are at Appendix A. The alternatives examined were:

    Base Case: Current J-Series Armored Brigade with two Armored Battalions and one Mechanized Battalion.

    Modified Base Case (Called Base Mod): Base Case with 2004 equipment (Block III, FIFV, LOSAT, NLOS).

    Alternative 1: Proposed ALB-F Brigade with two Armored Battalions and one Mechanized. Each Battalion had three companies (tank or mechanized) and 6 LOSAT. A Brigade Scout Platoon was added with 10 HMMWV's. In this option all CSS assets currently in battalions are consolidated in the Brigade FSB.

    d. All three alternatives were supported by two Attack Helicopter Battalions and a DS Artillery Brigade. Base Mod and Alternative 1 had improved intelligence assets including UAVs.

3. **Essential Elements of Analysis (EEA).**

    a. How agile is each alternative?

    b. What is the combat effectiveness of each alternative?

    c. How much effect do Brigade Scouts make?

    d. How well does Division Cavalry conduct counter-reconnaissance?

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A-1

e.   What are the CSS requirements to support ALB-F?

f.   Can aviation and artillery fix the enemy force to allow ground maneuver forces to maneuver to destroy the enemy.

4.   Summary of Results.   Reduction of the number of combat vehicles in the battalions did not appear to improve overall force agility.   In fact, reduction of the size of the battalions made them less able to press the attack after initial losses compared to current sized battalions.   Modernized/improved intelligence, on the other hand, improved unit agility.   During the scenarios examined, neither FASCAM nor attack helicopters were able to stop or fix the enemy; ground direct fire was required to complement indirect and helicopter fires.   The long road marches envisioned in AirLand Battle-Future will increase unit dependence on having responsive CSS assets.

5.   Methodology.

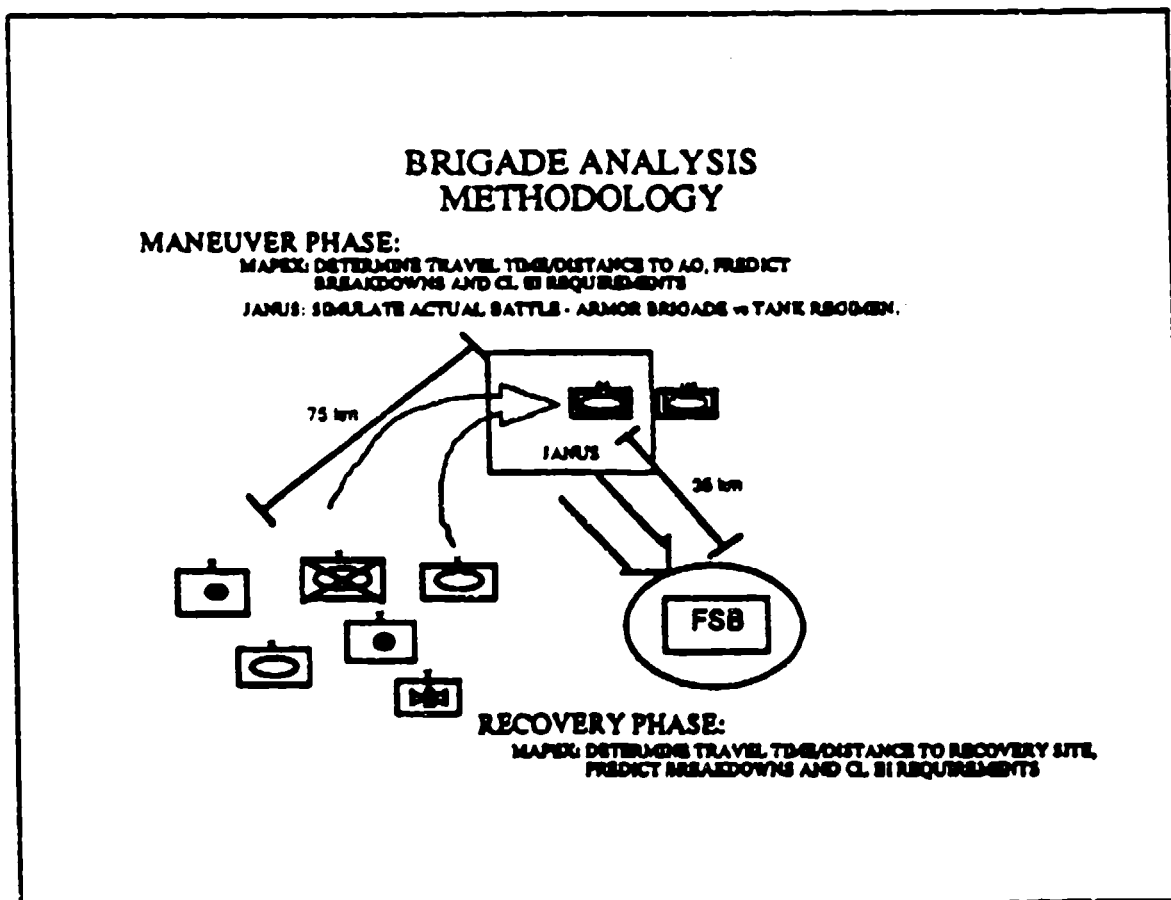a.   The analysis was conducted in two phases as shown in Figure 1:

Figure 1

2

b. Maneuver Phase: A Map Exercise (MAPEX) was conducted to determine the road distance from the enclave zone to the battle zone. Based on the Alternative Corps Design Study (ACORDS) scenario developed by the Combined Arms Combat Development Activity (CACDA) to support the TRADOC Commander's ALB-F General Officer Warfighting Seminar (GOWS) XI, the straight-line distance between the enclave and battle zones was estimated as 75km. This distance was laid on a map of West Germany and the two most direct routes determined. Actual road distance was measured for each of these routes then averaged to determine the distance the Brigade must actually move.

c. Combat elements of the Brigade moved on two routes. The resultant time includes only the battalions, Brigade Headquarters and NLOS battery. CSS units organic to the Battalion, minus trains, moved in the battalions as appropriate. All unit trains moved either after the Brigade or on a third route to eliminate their impact on the Brigade's movement.

d. Class III required for this move was computed using standard fuel usage rates used in the Armored Systems Modernization (ASM) Cost and Operational Effectiveness Analysis (COEA). Similarly, breakdowns were determined by the Mean Miles Between Operational Mission Failure (MMBOMF) figures from the ASM COEA.

e. A Janus simulation of the battle was conducted. Even though losses would have occurred due to RAM failures and attrition during the road march, both Red and Blue forces were assumed to enter the battle at 100% strength. An assumption was made that the relative force ratios would be the same when the forces met because losses due to the road march would be roughly equal. Subsequent research using the Defense Intelligence Agency (DIA) Manual "Soviet Army Replacement Operations", April 1981, confirmed this assumption.

f. Battle results and Class V requirements were extracted from Janus output. Class III usage was estimated using the Janus battle duration (2 hours) and the ASM COEA usage rates. Systems data used by Janus was from the ASM COEA and Light Helicopter Experimental (LHX) COEA.

g. Janus used three Blue and one Red station. This was done to accommodate the large number of Blue systems arrayed. In addition, a Brigade Commander exercised overall command and control over the Blue gamers.

h. The three alternatives were run in random sequence. The run stream is at Figure 2. Three Blue gamers were chosen randomly from a pool of six for each run. Five of the Blue gamers were Advanced Course Graduate captains. One was an Armor Staff Sergeant with extensive Janus experience.
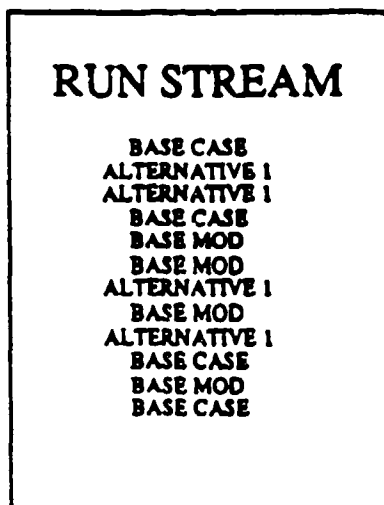
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┌─────────────────────────┐
│                         │
│    RUN STREAM           │
│                         │
│      BASE CASE          │
│    ALTERNATIVE 1        │
│    ALTERNATIVE 1        │
│      BASE CASE          │
│      BASE MOD           │
│      BASE MOD           │
│    ALTERNATIVE 1        │
│      BASE MOD           │
│    ALTERNATIVE 1        │
│      BASE CASE          │
│      BASE MOD           │
│      BASE CASE          │
│                         │
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Figure 2

i. The Brigade Commander was chosen randomly from a pool of four majors and promotable captains. A controller watched both Red and Blue actions to ensure they adhered to sound doctrine and to minimize gamesmanship.

j. Two Red gamers alternated games. All gamers had recently completed another study which required extensive Janus gaming. As a result, no training period was required due to the short period (one week) between the studies.

k. The simulation ended when Red or Blue was reduced to 40% strength in combat systems. At that point, one side would assume a hasty defense signalling the end of the meeting engagement.

l. Statistical significance was determined using the Mann-Whitney U-Test at 90% confidence level.

m. Recovery Phase: A MAPEX measured the time, Class III requirements, and breakdowns expected on the move from the Battle Area to a Recovery Area. The Recovery Area was located as close as possible to the Battle Area but out of indirect fire range. The road distance between the sites was measured as 35 km. The number of vehicles that completed the initial roadmarch and Janus battle was used as input for the road march. As in the earlier MAPEX, MMBOMP and Class III usage from the ASM COEA were used.

4

6. Measures of Effectiveness.

   a. Time to Move - Total time for the Brigade to move from first vehicle across the Line of Departure (LD) to last combat vehicle across the Release Point (RP).

   b. Percent of Force Available for Combat - Combat strength as a percentage of starting strength. All alternatives began the initial road march at 100% strength.

   c. Number of tanks/IFVs available - Quantity of vehicles remaining at each phase of the battle.

   d. Detections by Battalion and Brigade Scouts - Number of total detections by organic Battalion and Brigade (when available) Scouts.

   e. Enemy Reconnaissance Destroyed - A subjective judgement of the Blue Division Cavalry's ability to conduct counter-reconnaissance. This judgement was made by the game controller and gamers.

   f. Loss Exchange Ratio (LER) - Total Red losses divided by total Blue losses.

   g. Class III Requirements - Fuel status per tank by phase of the battle.

   h. Class V Requirements - Total number of tank rounds and IFV/CFV missiles expended during the battle.

   i. Ability to Fix the Enemy - FM 101-5-1 defines "fix" as "a force's ability to prevent the enemy from moving any part of his forces from a specific location and/or for a specific period of time...to prevent their withdrawal for use elsewhere." A subjective judgement using this definition was made by the controller and gamers of Blue's ability to fix the enemy.

   j. FASCAM Kills - Number of Red kills caused by Blue Family of Scatterable Mines (FASCAM).

   k. Artillery Kills on Red Maneuver - Number of Red maneuver forces killed by Blue artillery. This number excludes artillery-delivered mines counted by FASCAM kills to avoid double counting.

   l. Division Cavalry Detections - Total detections made by CFV/Future Reconnaissance Vehicle (FRV) in the Division Cavalry Squadron.

m. A crosswalk of the MOE to the EEA is in Figure 3.

CROSSWALK OF MOE/EEA

EEA\MOE	A	B	C	D	E	F	G	H	I	J	K	L
A	X											
B		X	X		X					X	X	
C				X								
D					X							X
E							X	X				
F									X	X	X	

Figure 3

7. Scenario

a. **Threat.** Using the ACORDS scenario, three first-echelon divisions were destroyed and the second-echelon tank division was attrited to 50% by CAS, Army Aviation, Artillery and the ACR. The threat for this maneuver analysis consisted of one of the remaining tank regiments (TR) of the reserve tank division. The TR was supported by a representative slice of artillery and division assets. The threat equipment list used was as projected for 2004 in the ASM COEA.

b. **Scheme of Maneuver.**

(1) The Blue brigade had the mission to find the attacking Red TR, attack and destroy it. The brigade then moved to a recovery area and prepared for follow-on operations. To accomplish this mission, the brigade conducted a road march to the battle area while sensors (division and organic) and scouts confirmed the location and activity of the TR. Blue initiated the attack with Artillery, Aviation and Non-Line-Of-Sight (NLOS).

6

(2)   As the forces converged, Blue attempted to fix the
TR with artillery-delivered FASCAM and aviation and maneuver to
attack with the three ground battalions. A general scheme of
maneuver is at Figure 4. Since Janus uses a man-in-the-loop, the
scheme of maneuver changed every run based on the gamers, terrain
and enemy situation. The scheme of maneuver presented was
developed by the Directorate of Combat Developments supported by
Command and Staff Department, USAARMS, as a guide for the gamers.
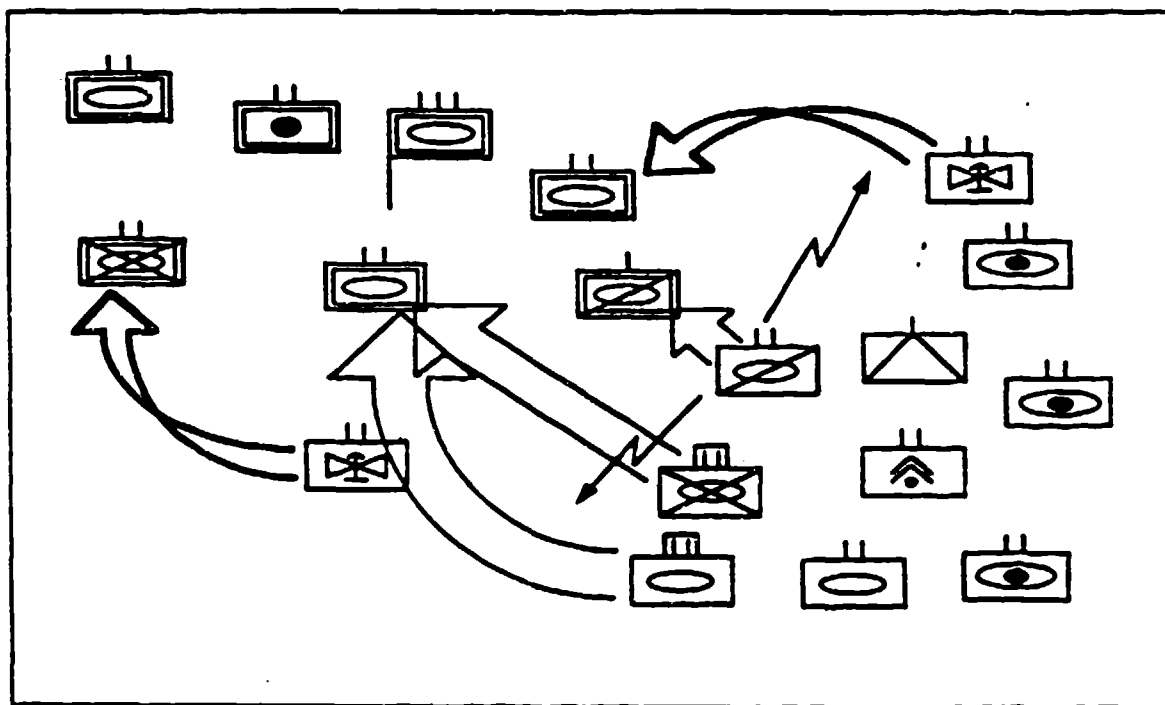
Figure 4

8.   Assumptions.

     a.   Current rate of Blue and Red modernization will continue
as projected to 2004.

     b.   Bridges encountered on the road march will support the
future tanks and IFV.

     c.   Since the Mean Time to Repair (MTTR) an M1A1 and a Block
III tank exceeds 4 hours, no vehicles that break down during the
road march will arrive at the battle in time to rejoin their
parent unit.

7

9. Limitations.

a. The road march results are highly scenario dependent. The road distance derived in West Germany may not be applicable to Middle East or Latin America scenarios.

b. Intelligence input in Janus is problematic. UAV's were used to provide players enhanced intelligence "feeds" to approximate future intelligence capabilities.

c. Two areas of West Germany (Bayreuth and Fulda areas) were available in Janus. Janus runs were made using both to provide a balance of close terrain and mixed terrain. This in no way should imply that ALB-F is European focused. The insights from this study should be applicable with minor modifications to other scenarios.

10. Results.

a. Agility of Each Alternative -

(1) The speed of the Brigade's movement, its ability to array its combat forces against the enemy, and its ability to react to unexpected enemy actions were used as measures of the Brigade's agility. Movement time for the alternatives is at Figure 5.

Alternative	Movement Time to Battle Area (HRS)	Movement Time to Recovery Site (HRS)
Base Case	3.7	1.2
Base Mod	3.7	1.2
Alternative 1	3.3	1.0

Figure 5

Modernization of the equipment in the force by itself(Base Case versus Base Mod) did not improve the Brigade's movement time. Decreasing the number of combat vehicles by 25% and removing CSS assets from the battalions minus emergency Class III and V (Base Mod versus Alt 1) only improves the Brigade's pass-time by 11 percent (3.7 to 3.4 hours) for the road march to the battle and 14 percent (1.2 to 1.0 hours) to the recovery area.

8

(2) Based on controller and player evaluations, the two modernized cases (Base Mod and Alt 1) provided Blue commanders an improved ability to array their forces against the enemy. The improvement appeared to be caused by the improved intelligence systems in the Brigade. The enhanced sensors allowed the Brigade Commander to commit earlier and more aggressively. The commander had more confidence that he would not be surprised or flanked. Better knowledge of the enemy allowed the commander to dictate the place and time of the battle.

(3) The modernized cases were also judged to be more able to deal with unexpected enemy actions than the Base Case because they were more aware of the enemy's movements. The enhanced sensors made them immediately aware of Red attempts to bypass or to break contact. Of the modernized cases, the reduced combat power in the Alternative 1 battalions caused them to lose agility after initial losses. The commanders became noticeably timid after losing a company because, in Alt 1, it constituted a 33% loss compared to 25% of a Base Mod battalion. As the battalions slowed their attack, the Brigade lost agility.

(4) Despite the enhanced intelligence picture in Base Mod and Alt 1 cases, the Brigade always had to retain a reserve. The Brigade Commander knew exactly where the enemy was and what he was doing. However, Red had sufficient options to allow him to miss the Blue force up until direct-fire contact was made. Blue had to retain the ability to meet multiple Red options until Red committed. Once in direct-fire contact with part of the Brigade, the reserve moved to reinforce the units in contact.

(5) The gamers observed that Blue's lack of countermine equipment gave Red (who had mine plows) an agility advantage when FASCAM was employed. Red habitually fired FASCAM on its flank to protect its movement, hindering Blue's movement. Red was better able to continue its attack in the face of FASCAM due to its organic countermine equipment.

b. Combat Effectiveness.

   (1) The addition of modernized equipment to a force more
than doubled the Brigade's combat effectiveness. The LER for
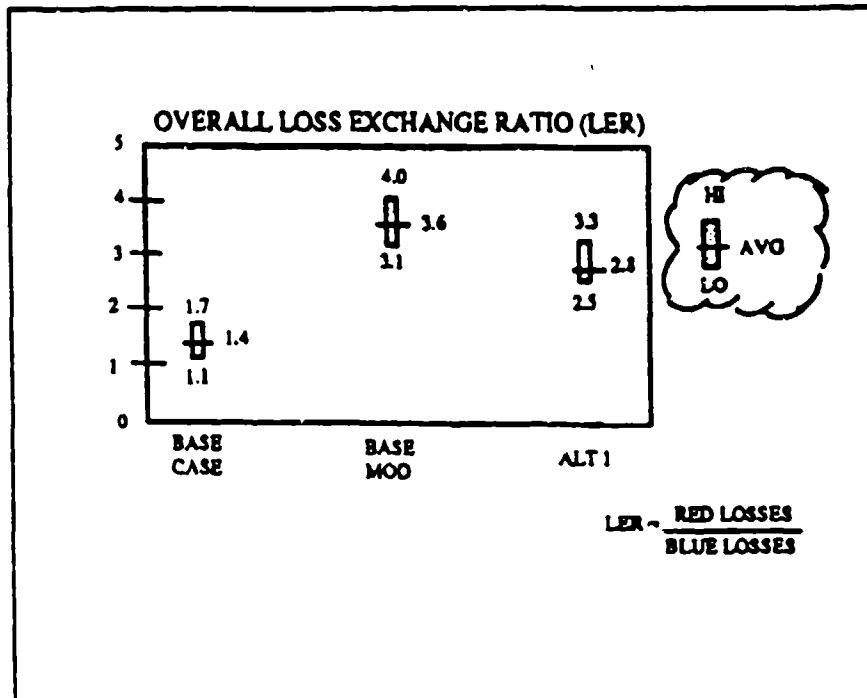each option is at Figure 6.

Figure 6

The primary contributor to the improvement of the modernized
cases is NLOS. NLOS killed an average of one red battalion each
run. The drop displayed between the Base Mod case and Alt 1 is
due to the reduced number of combat systems (1 less maneuver
company per battalion) in the Brigade. The total number of Blue
tanks lost in the battle was about the same; an average of 13
tanks ror Base Mod versus 12 for Alt 1. The number of Red
systems killed by the brigade, however, decreased due to the
lower concentration of Blue firers in Alt 1.

(2) The residual combat power of the brigade is best
measured by number of systems remaining at the end of an
operation. Figure 7 shows the number of tanks remaining at each
phase of the battle. The improved reliability and survivability
of the Block III tank contributed to the Brigade's ability to
conduct follow-on missions. Base Mod, having the advantage of
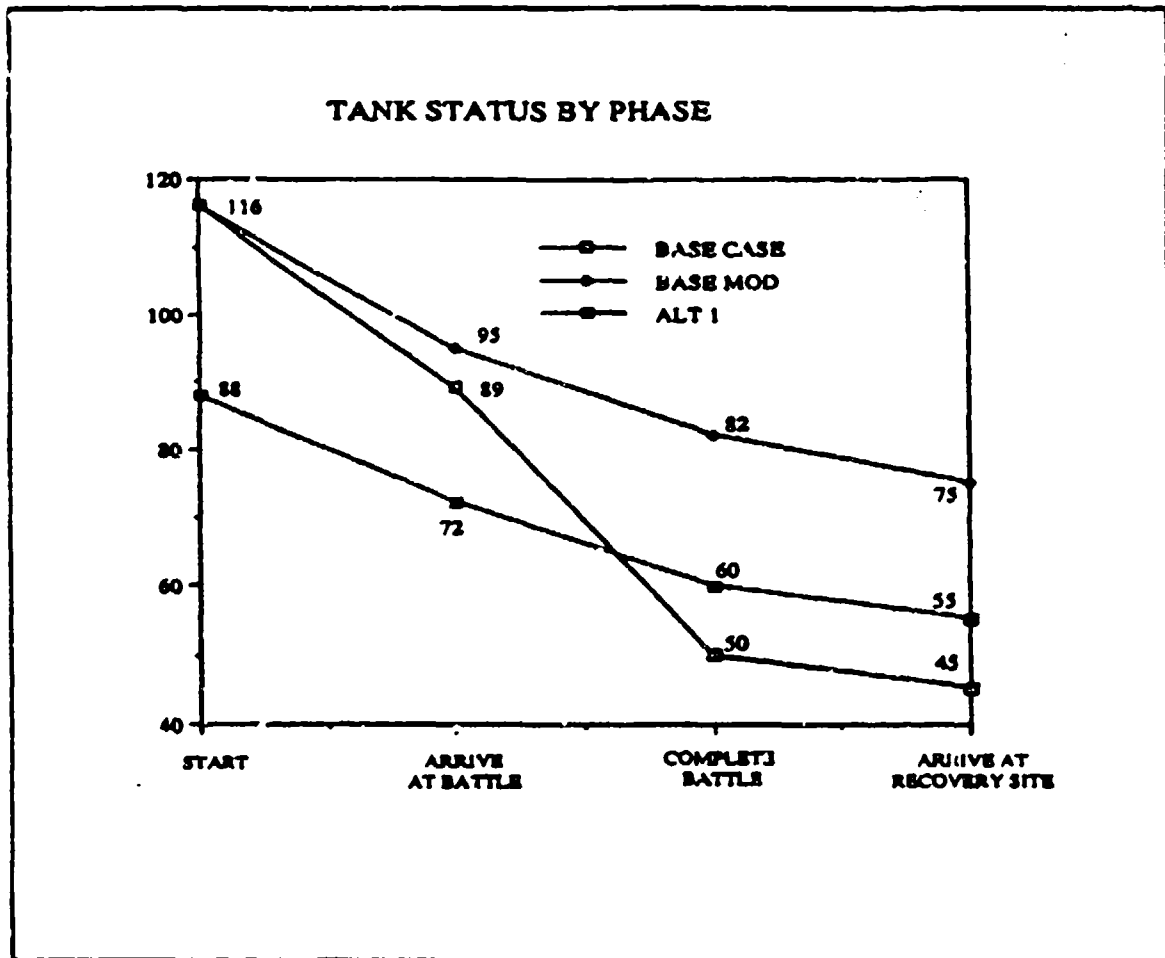both quantity and quality, retained the best capability to
conduct follow-on missions.

TANK STATUS BY PHASE

Figure 7

(3) Other major systems in the Brigade also proved very
survivable. NLOS losses were negligible. Artillery losses due
to counterbattery fire were light as a result of "shoot & move"
tactics. Both NLOS and artillery, however, fired their complete
basic load during the battle and could not conduct follow-on
missions until they received a full resupply.

11

c.   Protect the Force.

    (1) Battalion and Brigade Scouts. Battalion scouts were
used to screen flanks, confirm sensor input, fill gaps in the
cavalry screen and provide close-in reconnaissance for the
battalions. In Alt 1, the Brigade scouts reconnoitered brigade
routes, filled gaps and did close-in reconnaissance for the
brigade. Direct scout contribution to the battle was difficult
to quantify given the constraints of Janus. However, players
were unanimous in the feeling that the brigade scout platoons
improved their intelligence picture. One comparative measure of
their contribution is given by the number of detections made by
the scouts. The HMMWV scout detections are shown in Figure 8.
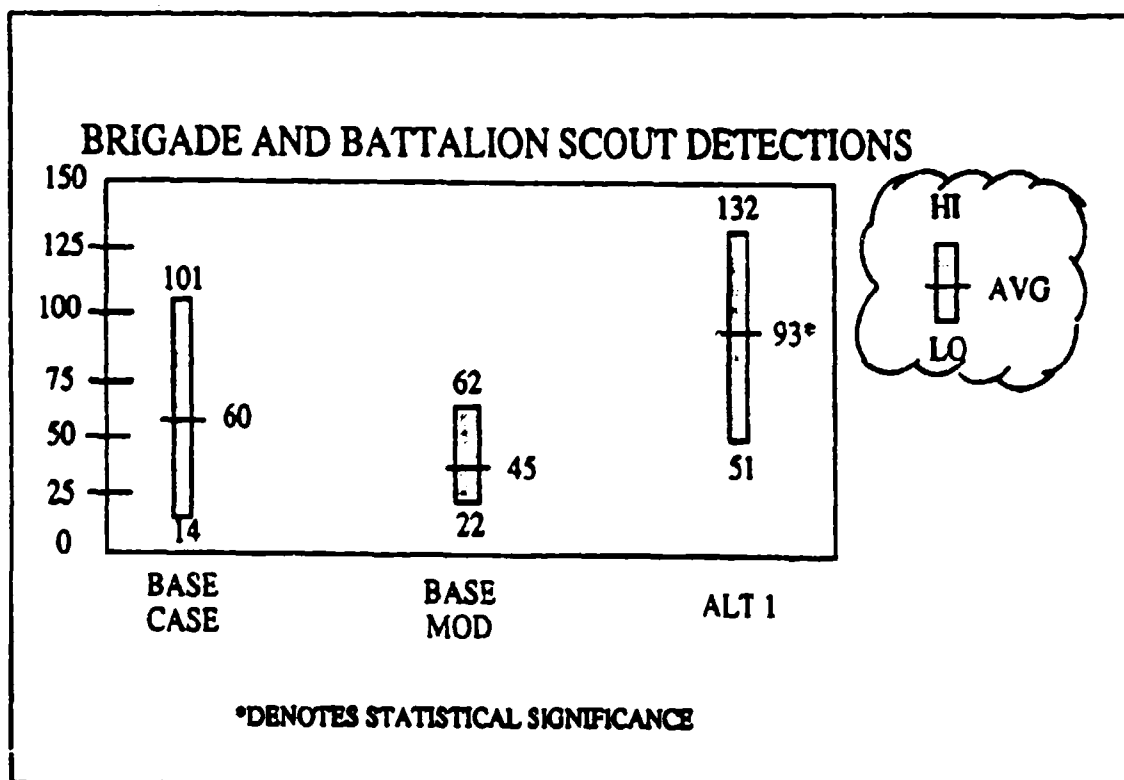Brigade scouts in Alt 1 improved the overall reconnaissance
picture.

Figure 8

(2) Cavalry Squadron Contributions.

(a) Division Cavalry contributions to combat operations where measured in two ways: Cavalry Scout detections and ability to destroy Red reconnaissance elements. Figure 9 shows the change in Cavalry Scout detections.
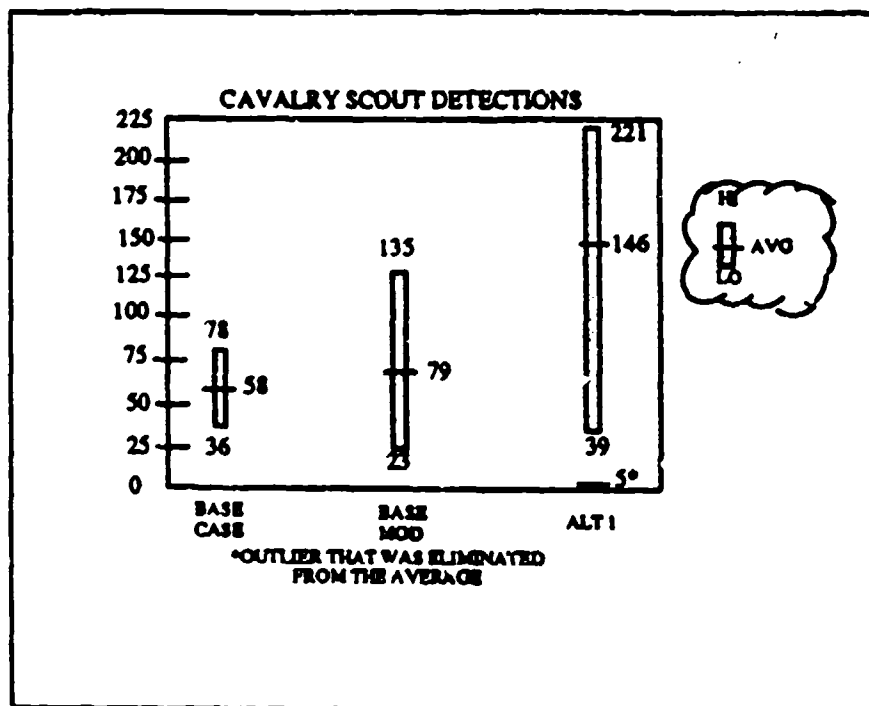

Figure 9

The FRV provided no improvement in detections as evidenced by the statistically insignificant difference between Base Case and Base Mod. The addition of one platoon of scouts and four platoons of tanks to the squadron, however, resulted in a dramatic increase in scout detections. The tanks improved scout survivability with the result that they could detect more. Figure 9 only displays scout detections, it does not include detections made by tanks.

(b)   The Division Cavalry's ability to conduct counter-reconnaissance is shown in Figure 10.

Alternitive	Rating	Reason
Base Case	Red	Red Regimental Recon Destroyed Blue Cavalry
Base Mod	Red	Red Regimental Recon Destroyed Blue Cavalry
Alt 1	Amber	Red Regimental Recon and Blue Cavalry Rendered Combat Ineffective

Figure 10

Including tanks in the squadron gave it the ability to destroy TR reconnaissance. Despite the improved organization, the Squadron did not retain enough reconnaissance assets after that fight to continue its mission. Detailed analysis of the Squadron is needed to determine the proper organization. Addition of tanks clearly improved the Squadron's capabilities and should be included in future organizational analyses.

d.   Recovery Operations

     (1)   Three aspects of recovery operations were evaluated:
fuel usage, vehicle losses, and ammunition expenditures.   Fuel
usage per tank by phase of the operation is shown at Figure 11.

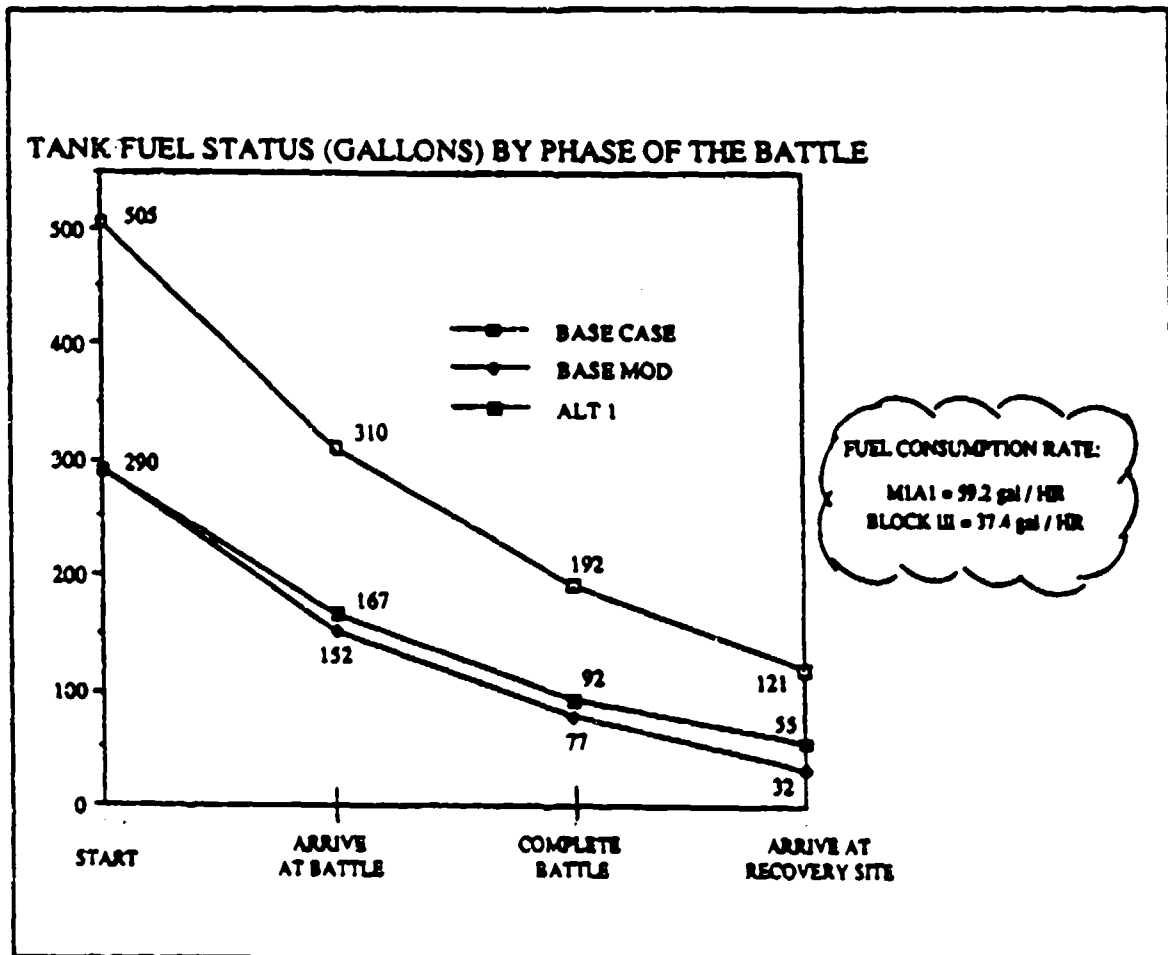TANK FUEL STATUS (GALLONS) BY PHASE OF THE BATTLE

Figure 11

Using the standard fuel usage rates shown, the M1A1 had about 2
hours of fuel remaining, the Block III had about an hour. In
both cases, tank fuel status is critical. Full Class III
resupply is necessary before the Brigade can conduct follow-on
operations.

        (2)   Tanks down or damaged must be found and repaired
before they can return to their units. The large number of
losses on the initial road march alone (Figure 12) indicates that
rapid, responsive repair capability is necessary. Given the Mean
Time to Repair an M1A1 is 4.7 hours and a Block III tank is 4.1
hours, it is imperative that maintenance assets travel with each
unit to provide the best chance of fixing broken down tanks
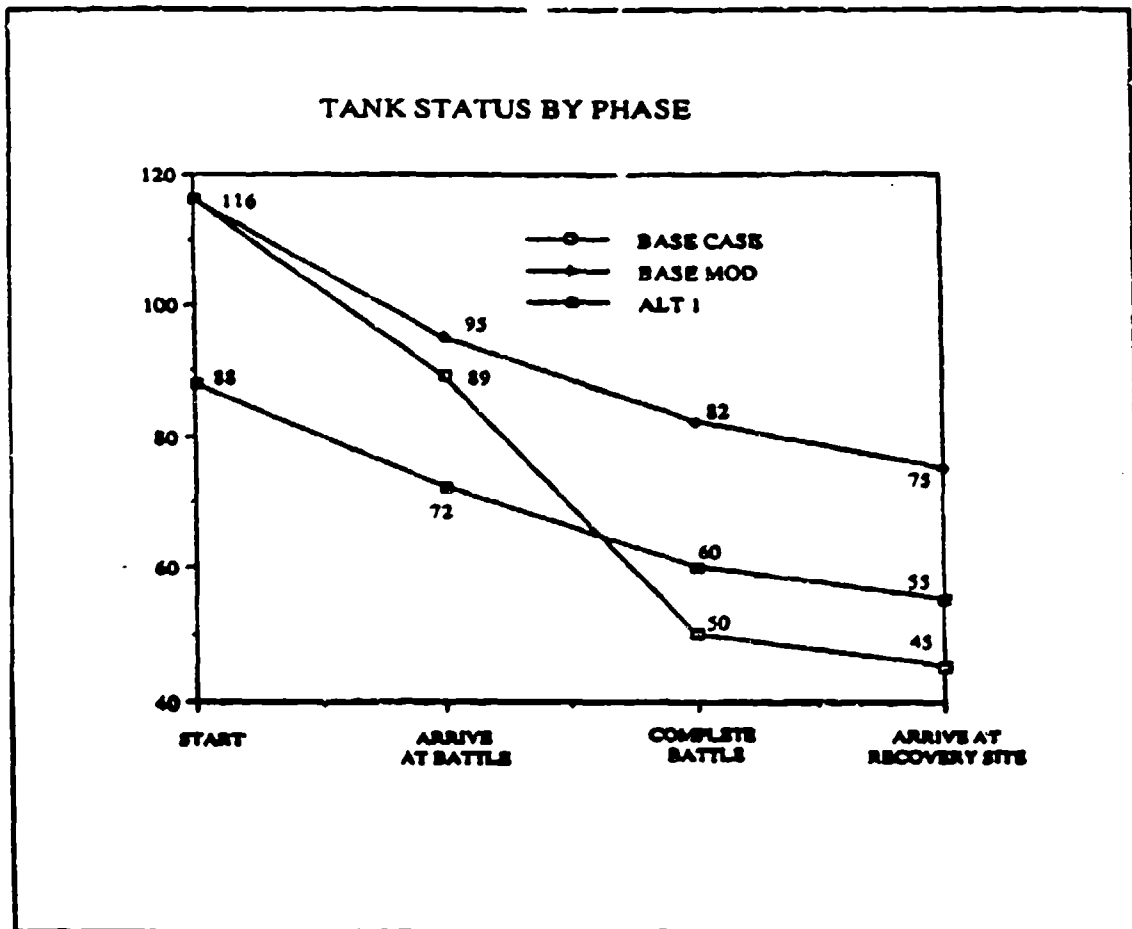quickly enough so that they can ·· ·· ·t the battle.

Figure 12

16

(3)   The low expenditure of main gun and IFV/CFV missile
ammunition, as shown in Figure 13, indicated that limited Class V
resupply is required for tanks and IFVs. Because expenditures
will not be uniformly distributed, some units will be virtually
out of ammunition while others will be near 100% because of their
position on the battlefield. Those units that are low on ammuni-
tion will be unable to cross-level and will need full resupply.
As noted before, the NLOS and Artillery Batteries fired their
entire basic load and required full resupply.

AMMUNITION EXPENDITURES

	TANK MAIN GUN RDS	IFV/CFV MISSILES
BASE CASE	180	62
BASE MOD	108	51
ALT 1	51	34

FIGURES ARE AVERAGE EXPENDITURES PER RUN

Figure 13

e.   Ability of Aviation and Artillery Assets to Fix the
Enemy.

        (1)   Aviation and Artillery were unable to fix the enemy.
They could slow a determined enemy but could not stop or hold the
enemy.   This is not to say that their effects were negligible.
The aviation battalions killed a tank battalion each run.   The
aviation System Exchange Ratio (SER) is shown in Figure 14.   The
improvement in the modernized cases is due to replacement of OH-
58C Helicopters with LHX.   The improved acquisition and laser
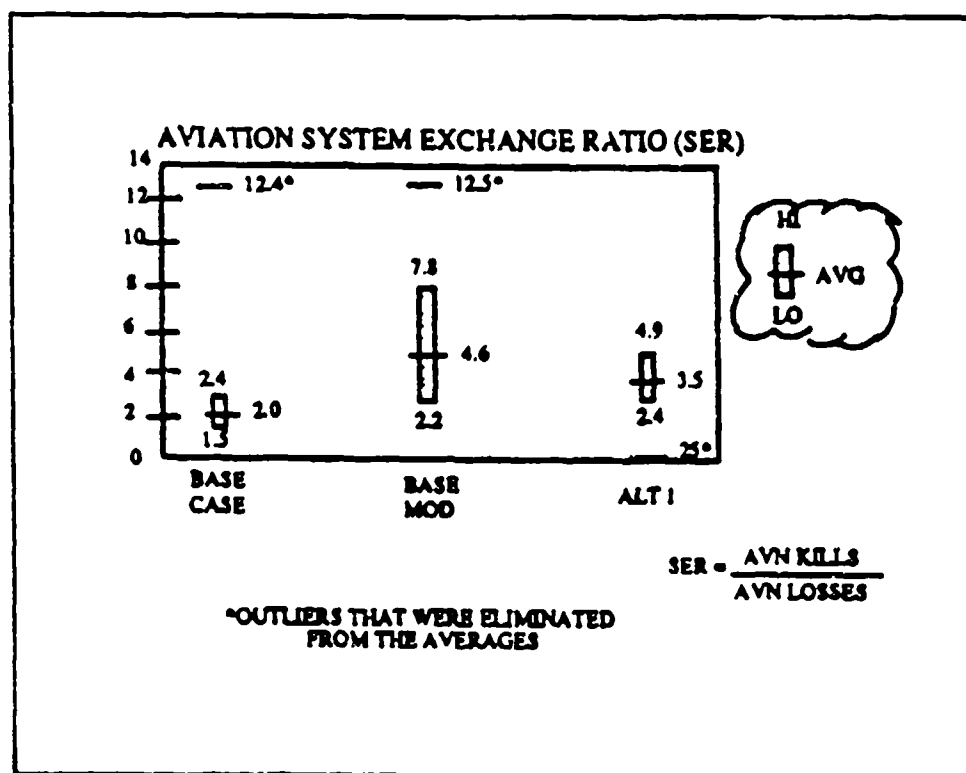designation capabilities of the LHX doubled the average SER.

Figure 14

(2) Artillery FASCAM, as stated, did not fix the enemy.
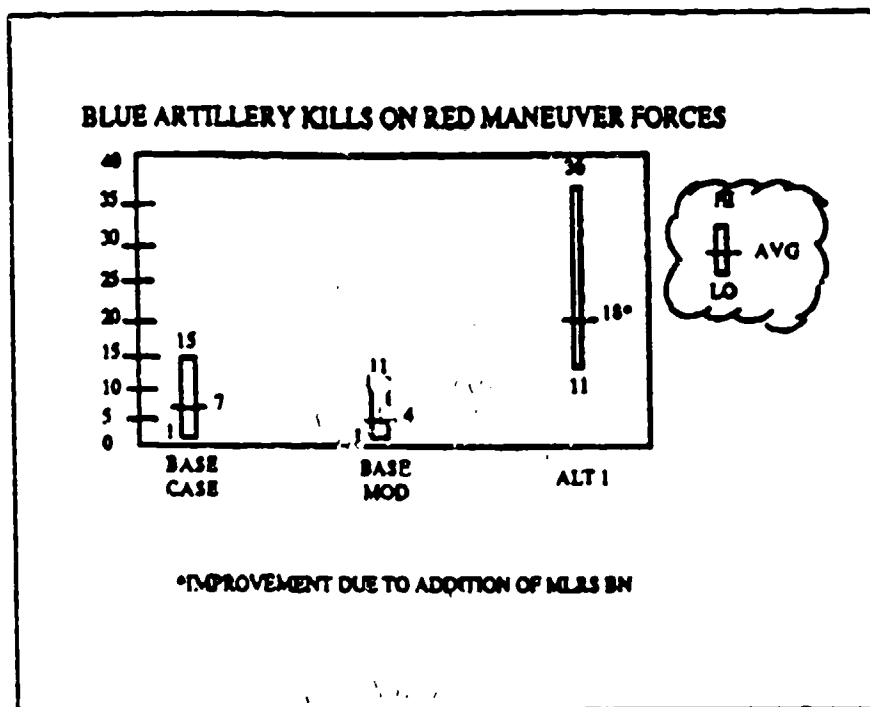Artillery did assist in the destruction of the enemy, as shown in
Figure 15.

BLUE ARTILLERY KILLS ON RED MANEUVER FORCES

*IMPROVEMENT DUE TO ADDITION OF MLRS BN

Figure 15

The increase in kills in Alt 1 is directly attributable to the
increase in MLRS systems firing ATACMS. The point cannot be
overemphasized that these critical assets fired their entire
basic load and required full resupply after only two hours of
combat.

11. Conclusions.

    a. Agility of the battalion does not appear to be improved
by reducing the size of the battalion. The ability of a
battalion to meet threats after initial losses actually decreases
when the initial number of combat systems decreases.

    b. Agility is improved by adding improved intelligence
systems to the force. Better intelligence allows the commander
to commit earlier with less fear of being flanked by an unknown
enemy.

    c. A reserve is still required because the Red can turn away
from Blue's intended engagement area up until the last moment.
Intelligence systems can tell place and activity of an enemy but
not intentions. Blue must be ready for the unexpected.

d. Brigade scouts improve the intelligence-collection effort of the brigade. Tanks improve the Division Cavalry Squadron's ability to conduct reconnaissance and counter-reconnaissance.

e. NLOS is key to killing the enemy at long range.

f. FASCAM and aviation slow but do not fix or turn a determined enemy.

ALTERNATIVES

BASE	BASE MOD	ALT 1

AR BDE
2 TK BN (58 M1A1)
1 MX BN (54 M2)
1 ITV CO (12 ITV)

DIV CAV
1 GRND TRP (18 M3)
1 AIR TRP (6 OHS8C, 4 AH1S)
SENSORS

AVN
2 ATK HEL BN
  (12 AH-64, 10 OHS8C)

ARTY
3 BN 1SS (24/BN)
MLRS BTRY (3)

ADA
PMS (6)

AR BDE
2 TK BN (58 BLK III)
1 MX BN (54 FIFV)
1 LOSAT CO (12 LOSAT)

DIV CAV
1 GND TRP (18 FRV)
1 AIR TRP (10 LHX)
ENHANCED SENSORS

AVN
2 ATK HEL BN
  (12 AH-64, 8 LHX)

ARTY
3 BN AFAS (24/BN)
MLRS BTRY (3)
NLOS (12 LNCHR, 8 MSL PER)

ADA
PMS (6)
ADATS (8)
NLOS-AD (6)

AR BDE
2 TK BN (44 BLK III)
1 MX BN (41 FIFV)
1 LOSAT CO (12 LOSAT)
BDE SCOUTS (10 HMMWV)

DIV CAV
2 GND TRP (12 FRV, 9 BLK III)
1 AIR TRP (10 LHX)
ENHANCED SENSORS

AVN
2 ATK HEL BN
  (12 AH-64, 8 LHX)

ARTY
3 BN AFAS (24/BN)
MLRS BN (27)
NLOS (12 LNCHR, 8 MSL PER)

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